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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/020,362	10/30/2001	Paul Joseph Stewart	200-1772	2674

7590 03/19/2004  
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EXAMINER

WALLACE, SCOTT A

ART UNIT	PAPER NUMBER
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2671

DATE MAILED: 03/19/2004

*3*

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/020,362

Applicant(s)

STEWART ET AL.

Examiner

Scott Wallace

Art Unit

2671

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 2 10/30/01.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 5 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Beale, U.S. Patent No. 5,923,329.

3. As per claim 5, Beale discloses a method of direct mesh manipulation of a mesh model (column 8 lines 23-31), said method comprising the steps of: selecting a geometric model (column 6 lines 43-53), wherein the model is a computer aided design (CAD) format (column 6 lines 43-53); converting the CAD model into a mesh model (column 8 lines 23-31, grid); evaluating the mesh model using a computer aided engineering (CAE) analysis (column 1 lines 30-50); determining whether to vary a design criterion (column 1 lines 30-50); modifying the predetermined design criterion (column 1 lines 30-50), if determined to vary a design criterion; updating the mesh model to include the modified design criterion using direct mesh manipulation (DMM) of the mesh model (column 1 lines 30-50), wherein a surface of the mesh model affected by the modified design criterion is described using a Dirichlet parameter distribution to determine a displacement of the surface (column 11 lines 9-15); modifying the feature surface of the mesh model by the displacement (column 1 lines 30-50); and using the updated mesh model (column 1 lines 30-50).

4. As per claim 12, Beale discloses selecting a geometric model, wherein the model is in a computer aided design (CAD) format (column 1 lines 30-50); converting the CAD model into a mesh model (column 1 lines 30-50); evaluating the mesh model using computer aided engineering (CAE) analysis (column 1 lines 30-50); determining whether to vary a predetermined design criterion (column 1 lines 30-50);

modifying the predetermined design criterion, if determined to vary the design criterion (column 1 lines 30-50); updating the mesh model to include the modified design criterion using direct surface manipulation (DSM) of the mesh model (column 1 lines 30-50); wherein a surface of the mesh model is embedded within a lattice structure having a volume (column 7 lines 40-45 and column 12 lines 25-30), a point within the volume is modified, and finite element analysis is applied to determine displacement (wherever the modified point is moved to this is the displacement) of each node within the lattice (column 12 lines 25-30), modifying the surface of the mesh model by the displacement (column 1 lines 30-50); and using the updated mesh model (column 1 lines 30-50).

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-2, 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beale, U.S. Patent No. 5,923,329 in view of Hariya et al., U.S. Patent No. 6,578,189.

3. As per claim 1, Beale discloses a system for direct mesh manipulation of a mesh model comprising: a computer system (column 6 lines 42-50); wherein said model is in a computer-aided design (CAD) format (column 6 lines 42-52); and a user using the computer system to convert the CAD model into a mesh model (column 1 lines 30-50), evaluate the mesh model using a computer aided engineering (CAE) analysis (column 1 lines 30-50), modify a predetermined design criteria (column 1 lines 30-50), and update the mesh model by direct mesh manipulation using Dirichlet parameter distribution to determine deformation of a surface of the mesh model (column 11 lines 9-14), so that the updated mesh model is available for further study (column 1 lines 30-50). However, Beale does not specifically disclose wherein

said computer system includes a memory, a processor, a user input device and a display device; and a computer generated geometric model stored in said memory of said computer system. This is disclosed in Hariya et al in column 4 lines 40-50. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have a user input device and a display device as in Hariya et al with the system of Beale because this would allow the user to change edit and the change the model for analysis.

4. As per claim 2, Hariya et al discloses wherein the computer system includes a knowledge-based engineering library (model database) and the geometric model is stored in the knowledge based engineering library (column 4 lines 40-50). This would allow users as in Beale to access the models built by other users so they don't have to waste building a particular model if it already exist.

5. As per claim 4, Beale discloses wherein the computer system updates the mesh model using direct mesh manipulation, by modeling a surface as a lattice structure to determine the deformation of the surface (column 8 lines 23-31).

6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Beale in view of Hariya et al in further in view of Sederberg, U.S. Patent No. 4,821,214.

7. As per claim 3, Beale with Hariya et al disclose wherein the computer system updates the mesh model using direct mesh manipulation (Beale, column 8 lines 23-31). However, Beale with Hariya et al do not disclose wherein a surface is modeled as a linear elastic sheet to determine deformation of the surface of the mesh model. This is disclosed in Sederberg in column 11 lines 60-68 and abstract. It would have been obvious to one of ordinary skill in the art at the time the invention was made to model the surface of Beale with Hariya as an elastic sheet because this would give the user a sense that the surface can deformed because it is elastic.

8. Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beale, U.S. Patent No. 5,923,329.

9. As per claim 6, Beale discloses defining an influence center for the feature (column 1 lines 30-50, whatever is modified is the influence center); modifying a mesh for the feature to include a node at the

influence center (column 1 lines 30-50 and column 3 lines 15-25); and applying the Dirichlet parametric distribution (column 11 lines 8-14) to the mesh of the feature to determine displacement of each node within the feature (column 1 lines 30-50, wherever the mesh is modified the nodes are displaced from the original position. Although Beale does not specifically disclose bounding a feature on the surface of the model with a closed curve, this would have been obvious to one of ordinary skill in the art at the time the invention was made because this allows the user to specify what portion of the model to modify.

10. As per claim 7, Beale discloses using finite element analysis (any analysis on the modified feature is finite element analysis, column 1 lines 30-50) to determine the displacement from the Dirichlet parametric distribution (column 1 lines 30-50 and column 11 lines 8-15).

11. As per claim 8, Beale discloses wherein the maximum displacement of the surface is at the influence center (column 1 lines 30-50). It is inherent that in the modified portion the center is the part that is displaced maximally.

12. Claims 9-11, 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beale in view of Blacker, U.S. Patent No. 5,315,537.

13. As per claim 9, Beale discloses selecting a geometric model, wherein the model is in a computer aided design (CAD) format (column 1 lines 30-50); converting the CAD model into a mesh model (column 1 lines 30-50); evaluating the mesh model using computer aided engineering (CAE) analysis (column 1 lines 30-50); determining whether to vary a predetermined design criterion (column 1 lines 30-50); modifying the predetermined design criterion, if determined to vary the design criterion (column 1 lines 30-50); updating the mesh model to include the modified design criterion using direct surface manipulation (DSM) of the mesh model (column 1 lines 30-50); modifying the surface of the mesh model by the displacement (column 1 lines 30-50); and using the updated mesh model (column 1 lines 30-50). However, Beale does not disclose wherein a surface of the mesh model is described as an elastic sheet and linear elastic finite element analysis is applied to determine displacement of the surface. This is disclosed in Blacker in column 1 lines 35-42, 62-68 and column 2 lines 1-2. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use elastic finite analysis with the

system of Beale because this gave more accurate displacement information (column 1 lines 65-68 and column 2 line 1).

14. As per claim 10, Beale discloses defining an influence center for the feature (column 1 lines 30-50, whatever is modified is the influence center); modifying a mesh for the feature to include a node at the influence center (column 1 lines 30-50). Blacker discloses describing the deformed feature as a linear elastic sheet that is stretched (column 1 lines 35-42, 62-68 and column 2 lines 1-2); and determining the displacement of each node in the mesh of the feature using linear elastic finite element analysis (column 1 lines 35-42, 62-68 and column 2 lines 1-2). Although Beale does not specifically disclose bounding a feature on the surface of the model with a closed curve, this would have been obvious to one of ordinary skill in the art at the time the invention was made because this allows the user to specify what portion of the model to modify.

15. As per claim 11, Beale discloses wherein the maximum displacement of the surface is at the influence center (column 1 lines 30-50). It is inherent that in the modified portion the center is the part that is displaced maximally.

16. As per claim 13, Beale discloses determining a position of a node for the mesh with respect to the lattice boundaries (column 3 lines 15-25); deforming a lattice point a predetermined displacement (column 1 lines 30-50, wherever the point is moved to is the displacement). Blacker discloses using linear elastic finite element analysis to determine displacement of the lattice point (column 1 lines 37-42, 62-68 and column 2 lines 1-2); and determining displacement of mesh nodes within the lattice to maintain their position with respect to the lattice boundary using linear elastic finite element analysis (column 1 lines 37-42, 62-68 and column 2 lines 1-2). ). Although Beale does not specifically disclose bounding a region of the mesh containing the surface with a lattice, this would have been obvious to one of ordinary skill in the art at the time the invention was made because this allows the user to specify what portion of the model to modify.

17. As per claim 14, Beale does not specifically disclose wherein said lattice point is a corner point of the lattice structure. However, since the point to be modified is determined by the user the user can choose any point including corner points.

18. As per claim 15, Beale disclose wherein the lattice point is a point within the interior of the lattice (column 5 lines 63-65).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Scott Wallace** whose telephone number is **703-605-5163**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Mark Zimmerman**, can be reached at 703-305-9798.

**Any response to this action should be mailed to:**


Commissioner of Patents and Trademarks  
Washington, D.C. 20231

**or faxed to:**

**(703) 872-9314 (for Technology Center 2600 only)**

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

  
MARK ZIMMERMAN  
SUPERVISOR, PATENT EXAMINER  
TECHNOLOGY CENTER 2600